Physical Science 2 Notes 2.2 Acceleration **NAME:** Key
Mr. Tima 2008-09

1. What is acceleration? a change in velocity
2. Does acceleration change when an object changes its speed? Its direction? Explain. yes, yes
3. Is an object that is slowing down accelerating? Explain. yes, in the negative Direction
4. Does acceleration have a direction? yes
5. How do you calculate acceleration? $a = \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{t}$
6. What is the unit of acceleration? m/s^2
7. Draw examples of graphs for constant speed (zero acceleration), positive acceleration, and negative acceleration.
8. Compare and contrast wood and steel roller coasters.

Section 2.2 Acceleration Practice Problems- Physical Science 2

Show your work, use correct units throughout, and highlight/ circle your answers.

For each problem (#1-10):

IDENTIFY EACH VARIABLE: v_f, v_i, a, and t

USE THIS EQUATION: $a = (v_f - v_i/t)$

NEGATIVE ACCELERATION = SLOWING DOWN

POSITIVE ACCELERATION = SPEEDING UP

1. A car beginning at rest is moving at 50 m/s after 10 s. What is the car's acceleration?

GIVEN	WORK / PICTURE	ANSWER
$v_i = 0$ m/s $v_f = 50$ m/s $t = 10$ s $a = ?$	$a = \frac{v_f - v_i}{t}$ $a = \frac{50 - 0}{10}$ $a = \frac{50 m/s}{10 s}$ $a = 5 m/s^2$	$5 m/s^2$

2. A roller coaster started at rest is moving at 60 m/s after 20 s. What is the roller coaster's acceleration?

GIVEN	WORK / PICTURE	ANSWER
$v_i = 0$ m/s $v_f = 60$ m/s $t = 20$ s $a = ?$	same as above	$3 m/s^2$

3. A car is moving at 20 m/s and slows to a velocity of 10 m/s in 10 s. What is the car's acceleration?

GIVEN	WORK / PICTURE	ANSWER
$v_i = 20$ m/s $v_f = 10$ m/s $t = 10$ s $a = ?$	same as above	$-1 m/s^2$

4. A person is running at 4 m/s and slows to a velocity of 0 m/s in 4 s. What is the person's acceleration?

GIVEN	WORK / PICTURE	ANSWER
$V_i = 4 m/s$ $V_f = 0 m/s$ $t = 4 s$ $a = ?$	same as above	$-1 m/s^2$

5. A plane is moving at 100 m/s and increases its velocity to 150 m/s over 25 s. What is the plane's acceleration?

GIVEN	WORK / PICTURE	ANSWER
$V_i = 100 m/s$ $V_f = 150 m/s$ $t = 25 s$ $a = ?$	same as above	$2 m/s^2$

6. A car begins rolling down a hill and reaches a speed of 25 m/s after 60 s. What is the car's acceleration?

GIVEN	WORK / PICTURE	ANSWER
$V_i = 0 m/s$ $V_f = 25 m/s$ $t = 60 s$ $a = ?$	same as above	$.42 m/s^2$

7. A bird begins at 1 m/s and slows to 0 m/s in 5 s. What is the bird's acceleration?

GIVEN	WORK / PICTURE	ANSWER
$V_i = 1 m/s$ $V_f = 0 m/s$ $t = 5 s$ $a = ?$	same as above	$-.2 m/s^2$

8. The wind is moving at 6 m/s and suddenly gusts to 8 m/s over 1 s. What is the wind's acceleration?

GIVEN	WORK / PICTURE	ANSWER
$V_i = 6 m/s$ $V_f = 8 m/s$ $t = 1 s$ $a = ?$	same as above	$2 m/s^2$

9. A bus has an acceleration of 2 m/s^2. If the bus's final velocity after 5 s is 10 m/s, what was the bus's initial velocity?

GIVEN	WORK / PICTURE	ANSWER
$a = 2 m/s^2$ $V_f = 10 m/s$ $t = 5 s$ $V_i = ?$	$a = \frac{V_f - V_i}{t}$ $2 = \frac{10 - V_i}{5}$ $10 = 10 - V_i$ $\frac{0}{-1} = \frac{-V_i}{-1}$ $V_i = 0$	$0 m/s$

10. A truck has an acceleration of 15 m/s^2. If the truck's initial velocity is 2 m/s, what is the truck's final velocity after 10 seconds?

GIVEN	WORK / PICTURE	ANSWER
$a = 15 m/s^2$ $V_i = 2 m/s$ $t = 10 s$ $V_f = ?$	$a = \frac{V_f - V_i}{t}$ $15 = \frac{V_f - 2}{10}$ $150 = V_f - 2$ $152 = V_f$	152 m/s

USING PROBLEMS (#1-10) ABOVE ANSWER THE FOLLOWING

11. Which of the above problems represents an object speeding up? 1, 2, 5, 6, 8, 9, 10
12. Which of the above problems represents an object slowing down? 3, 4, 7
13. What does negative acceleration mean? speeding up in the neg direction (could be slowing down)
14. Explain 3 ways you can change your acceleration when driving a car.

Review

2.5 m/s

15. s = ? d = 5 m t = 2 s
16. s = 55 mph d = 67 miles t = ? 1.22 hr } $S = d/t$
17. s = 178 km/hr d = ? 712 km t = 4 hr
18. Compare and contrast displacement and distance.
19. Compare and contrast velocity and speed.

Acceleration/Speed Practice Calculations

Show your work, include all units, and highlight your answers.

1. A car begins rolling down a hill and reaches a velocity of 95 m/s after 60 s. What is the car's acceleration?

GIVEN	WORK / PICTURE	ANSWER
$V_f = 95 m/s$ $V_i = 0 m/s$ $t = 60$ $a = ?$	$a = \frac{V_f - V_i}{t}$ $a = \frac{95 - 0}{60}$ $a = \frac{95}{60}$ $a = 1.58$	$1.6 m/s^2$

2. A bird begins at 1 m/s and slows to 0 m/s in 8 s. What is the bird's acceleration?

GIVEN	WORK / PICTURE	ANSWER
$V_i = 1 m/s$ $V_f = 0 m/s$ $t = 8 s$ $a = ?$	same as above	$-.13 m/s^2$

3. The wind is moving at 26 m/s and suddenly gusts to 81 m/s over 1 s. What is the wind's acceleration?

GIVEN	WORK / PICTURE	ANSWER
$V_i = 26 m/s$ $V_f = 81 m/s$ $t = 1 s$ $a = ?$	same as above	$55 m/s^2$

4. A bus has an acceleration of 12 m/s^2. If the bus's final velocity after 5 s is 35 m/s, what was the bus's initial velocity?

GIVEN	WORK / PICTURE	ANSWER
$a = 12 m/s^2$ $V_f = 35 m/s$ $t = 5 s$ $V_i = ?$	$a = \frac{V_f - V_i}{t}$ $12 = \frac{35 - V_i}{5}$ → $60 = 35 - V_i$ $\frac{25}{-1} = \frac{-V_i}{-1}$ → $V_i = -25$	$-25 m/s$

5. A truck has an acceleration of 23 m/s^2. If the truck's initial velocity is 2 m/s, what is the truck's final velocity after 10 seconds?

GIVEN	WORK / PICTURE	ANSWER
$a = 23 m/s^2$ $V_i = 2 m/s$ $t = 10 s$ $V_f = ?$	$a = \frac{V_f - V_i}{t}$ $23 = \frac{V_f - 2}{10}$ → $230 = V_f - 2$ $232 = V_f$	$232 m/s$

Review

6. s = 87 km/hr d = 12 km t = ? 0.138 hr
7. s = ? d = 76 km t = 6 hr 12.7 km/hr
8. s = 54 km/hr d = ? t = 4 hr 216 km

$S = \frac{d}{t}$

9. Convert each of the following to scientific notation:
   a. 7,600,000 → 7.6×10^6
   b. 0.00067 → 6.7×10^{-4}
   c. 101 → 1.01×10^2
   d. 0.100 → 1×10^{-1}
   e. 100 → 1×10^2